View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Edinburgh Research Explorer

THE UNIVERSITY of EDINBURGH

Edinburgh Research Explorer

Baseline HPV prevalence in rectal swabs from men attending a sexual health clinic in Scotland

Citation for published version:
Cameron, RL, Cuschieri, K & Pollock, KGJ 2019, 'Baseline HPV prevalence in rectal swabs from men attending a sexual health clinic in Scotland: assessing the potential impact of a selective HPV vaccination programme for men who have sex with men', *Sexually transmitted infections*.
https://doi.org/10.1136/sextrans-2018-053668

Digital Object Identifier (DOI):
10.1136/sextrans-2018-053668

Link:
Link to publication record in Edinburgh Research Explorer

Document Version:
Peer reviewed version

Published In:
Sexually transmitted infections

General rights
Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy
The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

Download date: 11. May. 2020

Baseline HPV prevalence in rectal swabs from men attending sexual health clinics in Scotland: assessing the potential impact of a selective HPV vaccination programme for men who have sex with men

Ross L. Cameron[1], Kate Cuschieri[2] and Kevin G.J Pollock[1]

1. Health Protection Scotland, Glasgow, Scotland, UK

2. Scottish Human Papillomavirus Reference Laboratory, Edinburgh, Scotland, UK

Corresponding author: Ross L. Cameron

5 Cadogan Street

Glasgow

G2 6QE

Tel: +44 141 207 1844

Email: ross.cameron@nhs.net

Word count: 1, 559

ABSTRACT

Objectives

A human papillomavirus (HPV) vaccination programme targeted towards men who have sex with men (MSM) who are disproportionately affected by HPV ano-genital infection and related disease was established in Scotland in July 2017. We aimed to establish a baseline HPV prevalence to assess the potential impact of the programme.

Methods

Residual rectal swabs taken in a sexual health clinic (n=1248) were tested for the presence of HPV and HPV type prevalence was collated and stratified by age. Prevalence of HPV types included in the quadrivalent and nonavalent vaccines were specifically assessed.

Results

72.8% (95% CI 70.2-75.3%) of swabs were positive for HPV with 59.1% (95% CI 56.3-61.9%) of samples positive for at least one high risk type. A least one of HPV 6, 11, 16 and 18 were detected in approximately half of the swabs. HPV prevalence generally increased with age but did not significantly differ between older age groups. The presence of more than one HPV type increased with age and over half of samples had multiple types present.

Conclusions

While HPV prevalence in this population is high, the potential impact of the vaccination programme is substantial given that 50% are not infected with a vaccine type. Defining a pre-immunisation baseline in this group will be important for longitudinal monitoring of impact.

INTRODUCTION

A human papillomavirus (HPV) immunisation programme for gay, bisexual and other men who have sex with men (MSM) up to age 45 was introduced in Scotland in July 2017, in addition to the school-based vaccination programme targeting girls implemented in 2008. MSM are now routinely offered the quadrivalent HPV vaccine through sexual health clinics and most are offered a three dose schedule. The programme was initiated based on advice from the UK Joint Committee on Vaccination and Immunisation (JCVI), which recognised that MSM receive little benefit from the current national female only HPV programme while being at excess risk of HPV associated disease.[1]

High-risk HPV infection is responsible for 90% of anal cancer, of which over 80% are associated with HPV 16 infection. HPV ano-genital infection and related disease is disproportionately higher in MSM who are 20 times more likely than heterosexual men to develop anal cancer. Additionally, the incidence of HPV-related oropharyngeal cancer is increasing in high-income countries in all men.[2,3] Genital warts are also one of the most common sexually transmitted diseases and can have debilitating social, sexual and psychological effects for affected individuals with 50% of patients having another episode of genital warts within one year of clearance.[4] The potential beneficial impact of the HPV immunisation programme for MSM is therefore considerable.

We tested residual rectal swabs from men for HPV to establish a proxy baseline prevalence of HPV in MSM before the introduction of the immunisation programme to support the potential impact of the programme on HPV-infection and associated disease in this group.

METHODS

The rectal swabs included in the study were collected between October 2016 and February 2017 and taken from men who attended for an asymptomatic sexual health screen or for treatment of a presumed sexually transmitted infection. The samples were taken in a sexual health clinic within

NHS Lothian, a National Health Service (NHS) Scotland health board which covers 16% of the Scottish population and includes the City of Edinburgh and surrounding counties. The rectal swabs were clinician collected and originally taken for routine *Chlamydia trachomatis* and *Neisseria gonorrhoeae* testing using the Abbott RealTime CT/NG assay (Abbott Laboratories, Abbott Park, IL, USA).

HPV DNA was extracted from 1 ml aliquots of residual swab material and genotyped by the Scottish HPV Reference Laboratory using the Optiplex HPV Genotyping Kit (Diamex, Heidelberg, Germany) which detects 24 types including low-risk types. HPV types 16/18/31/33/35/39/45/51/52/56/58/59/68 were considered high-risk in line with the International Agency for Research on Cancer (IARC) classifications. Thirty-eight samples were insufficient for HPV testing due to too little residual sample or endogenous control failure.

The genotyping results were collated along with basic demographic details and a study identifier. Assessment of type specific prevalence of HPV 6, 11, 16 and 18 was performed (types within the quadrivalent vaccine). Additionally, type specific prevalence of the aforementioned types and HPV 31, 33, 45, 52 and 58 was also assessed as these are the types present in the nonavalent vaccine which may be utilised in the future. Analysis was performed centrally at Health Protection Scotland using R studio version 3.4.1 and Microsoft Excel 2007. A linear trend test was used to assess evidence for a linear trend in positivity of selected combined HPV types by age group.

RESULTS

Overall, 1210 samples were included in the final analysis. The highest proportion of samples were from men aged 45 years and older (282, 23.3%), followed by 21-25 year olds (237, 19.6%) and 26-30 year olds (197, 16.3%). The mean age of the men from which the samples were taken was 36 years old (range 18-88 years old). The results of *C. trachomatis* and *N. gonorrhoeae* testing of the swabs were obtained and <1% were positive for *C. trachomatis* and none for *N. gonorrhoeae*.

Table one presents the overall and age-specific prevalence of different HPV types. Overall, 72.8% of samples were positive for HPV with 59.1% of samples positive for at least one high risk type. HPV 16 was the most commonly detected HPV type. At least one HPV type covered by the quadrivalent vaccine was present in just under half of the samples (49.6%) while 57.9% of samples contained at least one HPV type covered by the nonavalent vaccine with detections being high across all age groups with the exception of the youngest age group. The prevalence of HPV 6, 11, 16 and 18 individually was 15.3% (95% CI 13.3-17.4%), 7.4% (95% CI 6.0-9.1%), 33.4% (95% CI 30.7-36.1%) and 7.6% (95% CI 6.2-9.2%) respectively. Prevalence of the five types included in the nonavalent vaccine in addition to the types in the quadrivalent vaccine ranged between 3.6% (95% CI 2.7%-4.9%) for HPV 58 and 7.9% (95% CI 6.4-9.5%) for HPV 45.

Prevalence of any HPV type increased linearly with increasing age group ($p<0.001$). This linear pattern was also observed for high-risk types ($p<0.0001$) and HPV 16 and 18 ($p<0.001$) but was not observed for HPV 6 and 11 in which prevalence was highest in the 21-25 year old age group ($p=0.8355$). Prevalence of any HPV did not differ significantly between age groups older than 16-20 years. HPV 6 and 11 were most prevalent in the 21-25 year old age group but not significantly so compared to other age groups. HPV 16 was the most common HPV type across each age group with the exception of the 16-20 year old age group in which no HPV type predominated. No increasing linear trend was observed by increasing age in any of the HPV types in the quadrivalent vaccine other than HPV 16.

Table 1: Prevalence (%) (95% CI) of combinations of HPV types from rectal swab samples by age group

Prevalence (%) (95% CI) of combinations of HPV types from rectal swab samples by age group						
	Any HPV	**High-risk HPV***	**Nonavalent†**	**Quadrivalent‡**	**HPV 16/18**	**HPV 6/11**
Total (n=1210)	72.8 (70-75.3)	59.1 (56.3-61.9)	57.9 (55.0-60.7)	49.6 (46.7-52.4)	38.0 (35.3-40.8)	21.6 (19.3-24.0)
16-20 years (n=55)	52.7 (38.8-66.3)	30.9 (19.1-44.8)	34.5 (22.2-48.6)	30.9 (19.1-44.8)	14.5 (6.5-26.7)	16.4 (7.8-28.8)
21-25 years (n=237)	70.0 (63.8-75.8)	54.9 (48.3-61.3)	57.0 (50.4-63.4)	51.9 (45.3-58.4)	37.1 (31.0-43.6)	30.8 (25.0-37.1)
26-30 years (n=197)	70.1 (63.1-76.4)	54.3 (47.1-61.4)	50.3 (43.1-57.4)	43.1 (36.1-50.4)	32.0 (25.5-39.0)	18.3 (13.1-24.4)
31-35 years (n=192)	77.6 (71.0-83.3)	66.7 (59.5-73.3)	64.1 (56.8-70.8)	52.1 (44.8-59.3)	43.2 (35.4-51.7)	18.2 (13.0-24.4)
36-40 years (n=152)	71.7 (63.8-78.7)	59.9 (51.6-67.7)	58.6 (50.3-66.5)	52.0 (43.7-60.1)	43.4 (35.4-51.7)	19.1 (13.2-26.2)
41-45 years (n=95)	75.8 (65.9-84.0)	68.4 (58.1-77.6)	65.3 (54.8-74.7)	53.7 (43.2-64.0)	44.2 (34.0-54.8)	17.9 (10.8-27.1)
>45 years (n=282)	77.3 (72.0-82.1)	62.8 (56.8-68.4)	61.3 (55.4-67.1)	51.4 (45.4-57.4)	39.0 (33.3-45.0)	22.0 (17.2-27.3)

*High-risk HPV (HPV 16, 18, 31, 33, 45, 51, 52, 56, 58 and 59). †Nonavalent (HPV 6, 11, 16, 18, 31, 33, 45, 52 and 58). ‡Quadrivalent (HPV 6, 11, 16 and 18).

Over half of samples (52.1% 95% CI 49.2-55%) were positive for more than one HPV type. Of these, 34.9% (95% CI 31.1-38.7%) were positive for two HPV types and 27.6% (95% CI 24.1-31.2%) were positive for three types. The percentage of samples in which more than one HPV type was present increased with increasing age ($p<0.001$).

DISCUSSION

Our study is the first to estimate HPV prevalence in rectal swabs from males attending sexual health clinics in Scotland and will be used as a baseline to compare prevalence after the introduction of the MSM HPV vaccination programme. Prevalence of any HPV in rectal swabs in the present study was high and comparable to data assessed in a systematic review and meta-analysis that estimated rectal HPV prevalence in HIV-negative MSM and HIV-positive MSM as 63.9% (95% CI 55.2-72.6%) and 92.6% (95% CI 90.8-94.5%) respectively.[5] Prevalence of at least one quadrivalent vaccine type (49.6%)was higher compared to a study undertaken in a London sexual health clinic which found a prevalence of 29.1% in rectal swabs and may be due to inclusion of men over 40 in our study.[6]

Prevalence of HPV generally increased by age but did not significantly differ between the older age groups which is consistent with an Australian study which hypothesised that continued HPV acquisition occurs later in life due to ongoing sexual activity with multiple partners in older MSM.[7] This pattern was not observed for HPV 6/11 prevalence which is reflected in data from Australia which showed that anal wart prevalence is highest in younger MSM. This is possibly related to increased susceptibility of the anal epithelium or lack of acquired immunity in younger MSM to HPV 6 and 11.[8]

There are limitations to our study including the nature and size of the sample which was captured at a single health board in Scotland. While, the generalisability of our findings to the wider Scottish MSM community could be compromised this may be mitigated somewhat by the fact that the health board in question is the second largest in Scotland.

Additionally, confirmation of sexual identity was not proactively obtained from the men from whom the swabs were taken; however the likely indication for a rectal swab in a sexual health setting is considered a suitable marker for someone who engages in receptive anal sex.[9] HIV status of the sampled men was known for <10% of samples and sexual history data was not available; therefore risk status could not be assessed. The low prevalence of *C. trachomatis* and *N. gonorrhoeae* may suggest that our sample was from a lower risk population or that the majority of samples were taken during an asymptomatic sexual health screen.

The fact that around 50% of the sample did not test positive for an HPV type included in the quadrivalent vaccine suggests that the HPV immunisation programme targeting MSM in Scotland has the potential to significantly reduce HPV-driven disease. A HPV negative sample does not exclude previous HPV infection and the benefit of the vaccine may be lower in previously infected individuals, however, even these individuals may benefit from the vaccine as they would be protected from further exposures to other HPV types in the vaccine in which they are naïve to. [7] Nonavalent vaccine would be even more beneficial in this respect if offered in the future. Early trial results have shown the quadrivalent vaccine is associated with a reduction in all grades of anal intraepithelial neoplasia (AIN) in MSM.[10] Taken with our results and others, the offer of the HPV vaccine to MSM over the age of 45 years may also be beneficial. HPV typing of rectal swab and throat swab samples following initiation of the HPV programme in MSM and analysis of prescriptions for genital warts in the future will further enable the impact assessment of the HPV vaccine in MSM.

Acknowledgements: The authors would like to thank Cameron Watt for data validation and staff at the Scottish HPV reference lab for delivery of the HPV typing of the rectal swab samples.

Conflict of Interest: KP has received a travel grant to attend IPV conference September 2015 from Merck. KC (non personal) KC's institution has received grant funding or associated consumables to

support research from Qiagen, Hologic, Selfscreen, GeneFirst, Euroimmun, Cepheid, Genomica and LifeRiver

Ethical approval: Ethical approval was obtained from the East of Scotland Research Ethics Service REC 1 to use residual samples which have fulfilled their diagnostic requirement. Approval number: 15/ES/0094.

Funding: No funding

Authorship: RC performed the analysis and drafting of the initial manuscript. KC collated and typed the rectal swab samples and helped write the manuscript. KP helped write the manuscript and conceived the idea for the study.

The Corresponding Author has the right to grant on behalf of all authors and does grant on behalf of all authors, an exclusive licence (or non exclusive for government employees) on a worldwide basis to the BMJ Publishing Group Ltd to permit this article (if accepted) to be published in STI and any other BMJPGL products and sub-licences such use and exploit all subsidiary rights, as set out in our licence http://group.bmj.com/products/journals/instructions-for-authors/licence-forms

REFERENCES

1. The Joint Committee on Vaccination and Immunisation. JCVI statement on HPV vaccination of men who have sex with men. Department of Health. https://www.gov.uk/government/publications/jcvi-statement-on-hpv-vaccination-of-men-who-have-sex-with-men (Accessed April 2018).

2. Lin C, Franceschi S, Clifford GM. Human papillomavirus types from infection to cancer in the anus, according to sex and HIV status: a systematic review and meta-analysis. *Lancet Infect Dis* 2017;18(2):198-206.

3. Chaturvedi AK, Anderson WF, Lortet-Tieulent J, et al. Worldwide Trends in Incidence Rates for Oral Cavity and Oropharyngeal Cancers. *J Clin Oncol* 2013;31(36):4550-9.

4. Lee Mortensen G, Larsen HK. Quality of life of homosexual males with genital warts: a qualitative study. *BMC Res Notes* 2010;3(1):280.

5. Machalek DA, Poynten M, Jin F, et al. Anal human papillomavirus infection and associated neoplastic lesions in men who have sex with men: a systematic review and meta-analysis. *Lancet Oncol* 2012;13(5):487-500.

6. King EM, Gilson R, Beddows S, et al. Human papillomavirus DNA in men who have sex with men: type-specific prevalence, risk factor and implication for vaccination strategies. Br J Cancer 2015;112(9):1585-1593.

7. Poynten IM, Machalek D, Templeton D, et al. Comparison of age-specific patterns of sexual behaviour and anal HPV prevalence in homosexual men with patterns in women. *Sex Transm Infect* 2016;92(3):228-31.

8. Ong JJ, Fairley CK, Read TRH, et al. Age-specific pattern of anogenital warts in men who have sex with men. *Sex Transm Dis* 2018;45(3):186-188.

9. British Association for Sexual Health and HIV. 2015 BASHH CEG guidance on test for Sexually Transmitted Infections. https://www.bashhguidelines.org/media/1084/sti-testing-tables-2015-dec-update-4.pdf (Accessed April 2018).

10. Palefsky JM, Giuliano AR, Goldstone S, et al. HPV Vaccine against Anal HPV Infection and Anal Intraepithelial Neoplasia. *N Engl J Med* 2011;365(17):1576-85